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Concomitant malaria, dengue and COVID-19: an extraordinary challenge for Colombia's public health system[☆]

This Commentary follows up on the previously published article (<https://doi.org/10.1016/j.cosust.2011.10.004>) which appeared in Volume 3, Issue 6, December 2011, Pages 448–460

Germán Poveda

Department of Geosciences and Environment, Universidad Nacional de Colombia, Medellín, Colombia
e-mail: gpoveda@unal.edu.co

Malaria and dengue are vector-borne endemic diseases in the low-lying regions of Colombia. Outbreaks of both diseases appear during the occurrence of El Niño in the tropical Pacific. We present updated data confirming the relation, which are explained by the increase in temperature. Malaria shows an increasing trend, of which climate change cannot be disregarded. The migration of over 1 200 000 Venezuelans hiding away from the internal crisis has complicated the situation. Further research is needed to pinpoint the linkages between vector-borne diseases and climate variability, but also with current and future impacts of climate change, and alarming deforestation rates of Colombia. The public health system has been impacted by the COVID-19 pandemic, especially in the poorest and most vulnerable regions (Pacific coast, Amazon and Orinoco). This note constitutes a call to Colombia's public health system to maintain vector and water-borne diseases services, which cannot become neglected amid the COVID-19 pandemic.

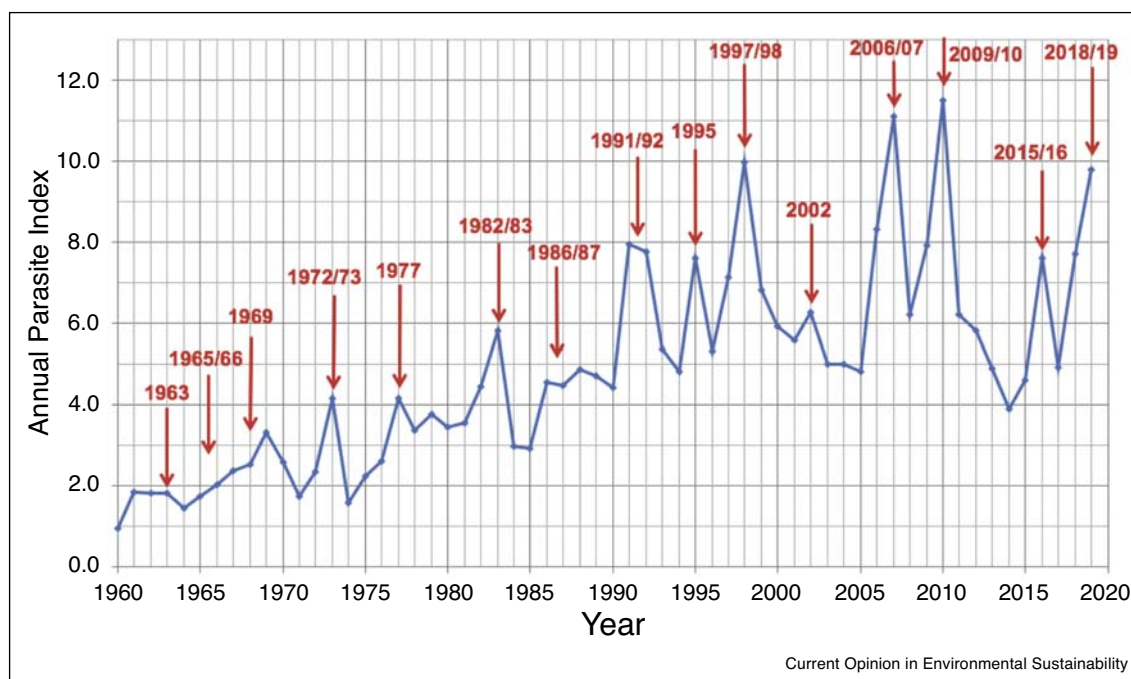
Malaria is an endemic disease in the low-lying hot and humid regions of Colombia, below 1.500 m a.s.l. (85% of the territory), mainly occurring in disperse rural settings, although the probable presence of endemic, unstable and low-intensity malaria transmission has been recently reported in urban and peri-urban areas of the Pacific coast and a few others in the eastern regions of the Amazon and Orinoco regions [1–5].

For more than 25 years research has been developed towards evidencing, understanding and modelling the linkages between El Niño, the warm phase of the El Niño/Southern Oscillation, and malaria outbreaks in Colombia [6–15]. Figure 1 shows the annual series of malaria incidence in Colombia from 1960 to 2019, represented by the Annual Parasite Index [(number of confirmed cases/population at risk) × 1000], using data from previous studies and the Colombian National Institute of Health. El Niño years are denoted by red arrows, according to the Oceanic Niño Index (ONI) of the National Oceanic and Atmospheric Administration of US. The two last months of 2019 and the three first months of 2020 were also under the influence of El Niño, and until the 39th epidemiological week of 2020 (September 20–26), 59 604 malaria cases have been reported in Colombia, of which 29 738 cases (49.9%) correspond to *Plasmodium falciparum*, 29 352 cases (49.2%) to *Plasmodium vivax*, and 514 cases (0.9%) to mixed malaria [16].

Malaria incidence shows both an increasing trend, of which climate change cannot be disregarded, as well as outbreaks (sudden jumps) during the occurrence of historical El Niño events in the tropical Pacific. The most important climatic factors that have been identified to explain the outbreaks of malaria during El Niño are, mainly, increases in air temperatures and reductions in rainfall brought about by El Niño in Colombia [17–19], due to an increase in the biting rates of the mosquito vector and the shortening of the duration of the sporogonic cycle (reproduction of the parasite inside the

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Figure 1



Time series of the Annual Parasite Index for malaria in Colombia from 1960 to 2019. Red arrows and years denote the occurrence of historical El Niño events. Data source: Refs. [6,7,9–11,13,14] and Colombian Ministry of Health and National Institute of Health.

mosquito). The increasing trend seems to be decreasing in recent years but malaria outbreaks keep coming back with El Niño events. The situation has been worsened with the on-going humanitarian crisis in the neighboring Venezuela which has triggered the migration of over 1 200 000 Venezuelan citizens to Colombia and other South American countries. In 2019 there were 2288 cases of imported malaria Colombia, with 95.7% from Venezuela [19]. Until the 27th epidemiological week of 2020 (June 28–July 4) there have been 296 imported cases with 95.3% from Venezuela [16].

Other endemic vector-borne diseases also exhibit well-documented strong outbreaks associated with El Niño in Colombia, such as dengue [20–23], which are mostly explained by the generalized increase in air temperature in Colombia during El Niño. A strong outbreak of dengue occurred during 2019 in Colombia with 127 553 cases, representing 475.4 cases per 100 000 people at risk [18]. Until the 39th epidemiological week (September 20–26), 69 219 cases of dengue have been reported (261.6 cases per 100 000 people), including 771 cases (1.1%) of hemorrhagic dengue [16].

Further research needs to be carried out to better understand the geo-bio-physical linkages between the occurrence of vector-borne diseases with climate variability in

Colombia, but also with the on-going and future impacts of climate change in the tropical Americas [24], and the alarming deforestation rates of the country, especially after the peace accord between the Colombian government and the leftist FARC guerrillas [25–36].

The whole public health situation in Colombia has been aggravated by the on-going COVID-19 pandemic worldwide. According to data from the Colombian Ministry of Health, until July 15, 2020, there have been 165 169 confirmed cases of COVID-19, with 71 736 recovered and 5814 deaths. The situation is especially worrisome in poor and vulnerable populations of the Pacific coast and the Amazon and Orinoco regions of Colombia, due to precarious transportation systems, lack of medicines, nonexistent laboratory testing capabilities, shortage of ICU personal and beds, mechanical ventilators and other specialized equipment, and ancient deficiencies in hospital infrastructure, amid poverty, marginalization, deficient public services' supply, high unemployment rates exacerbated by the socio-economic lockdown imposed by the pandemic, and strong socio-environmental vulnerability. This note constitutes an urgent call to Colombia's public health system to act to ensure the maintenance of malaria, dengue, and many other vector and water-borne diseases services, which cannot become neglected, amid the COVID-19 pandemic. The health sector must be

prepared to cope with the endemicity of the likely new outbreaks of malaria and dengue amid the COVID-19 pandemics. Will the poorest people of Colombia continue to be the next foretold victims of the simultaneous occurrence of ancient endemic diseases along with the new COVID-19? The answer is in the hands of the Colombian health authorities.

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